Dominion Diamond Mines ULC
900-606 4 Street SW
Calgary, Alberta T2P 1T1 (403) 910-1933
www.ddmines.com

March 12, 2019

Joseph Mackenzie, Chair
Wek'èezhìi Land and Water Board
#1, 4905 – 48th Street
Yellowknife, NT, X1A 3S3

Dear Mr. Mackenzie:

Re: Potassium Toxicity Study Design Version 1.1

Dominion Diamond Mines ULC (Dominion) is pleased to provide the Wek'èezhìi Land and Water Board (the Board) with Version 1.1 of the Potassium Toxicity Study Design (the Study Design). The Study Design is provided in accordance with requirements of the Water Licence Amendment – Potassium EQC, Part H, Condition 38(a), and the Board's Decision on Version 1.0. A summary of concordance is provided in Table 1-1 of the Study Design. Furthermore, Version 1.1 of the Study Design fulfills items (a) to (d) of the Board's Directive and Reasons for Decision on Version 1.0 (January 24th, 2019):

a) In addition to ammonia testing at test initiation and termination, Dominion is to measure ammonia prior to each water renewal for both *Hyalella azteca* and Fingernail Clams;
b) Add the following text: "The Potassium Toxicity Study Report will describe how the results demonstrate that potassium concentrations have been maintained throughout the exposure";
c) Include a discussion of the results of the Potassium Toxicity Study in consideration of previous testing results referenced by ECCC comment 2, in submission of the Potassium Toxicity Study Report; and,
d) The Board has approved the submission deadline for the Potassium Toxicity Study Report of August 30, 2019.

Dominion trusts that you will find the information to be clear and informative. Should you have any questions, please contact Giovanna Diaz, Environment Specialist – Fisheries and Aquatics, at Giovanna.Diaz@ddcorp.ca or 403-910-1933 ext. 2405 or the undersigned at Harry.O'Keefe@ddcorp.ca or 867-445-3185.

Sincerely,

Original signed by Harry O'Keefe

Harry O'Keefe
Team Lead – Environment Projects

Record #:HSE RCD ENV 1149;
Document Owner: Environment Department;
Date: 7-Mar-2019
Template # EKA TEM 1852.13

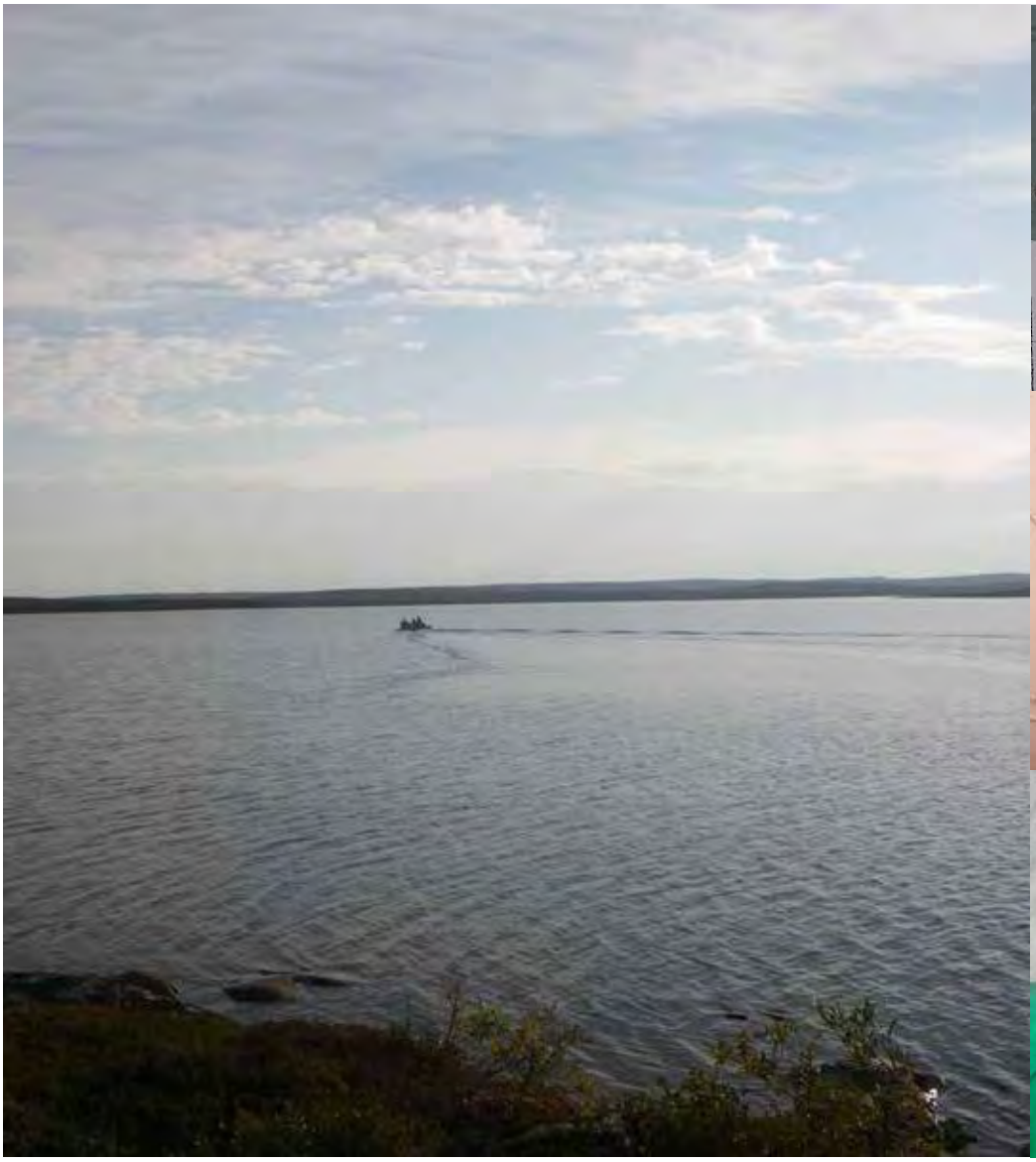
Dominion Diamond Mines ULC
900-606 4 Street SW
Calgary, Alberta T2P 1T1 (403) 910-1933
www.ddmines.com

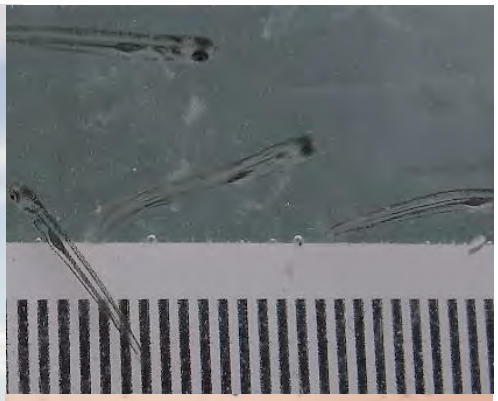
References:

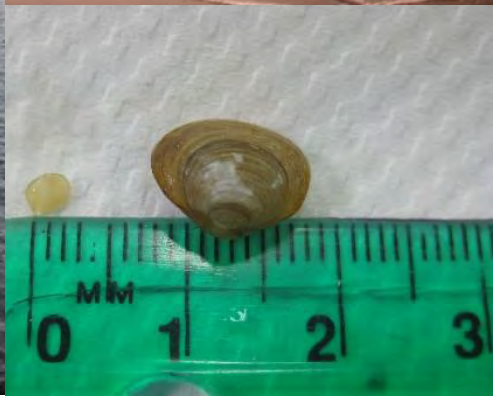
Environment and Climate Change Canada (ECCC). 2017. Biological test method: test for survival, growth and reproduction in sediment and water using the freshwater amphipod *Hyalella azteca*. Third Edition. EPS1/RM/33. September 2017.

Ekati Diamond Mine

Potassium Toxicity Study Design
Version 1.1







Dominion Diamond Mines

Dominion Diamond Mines ULC

EKATI DIAMOND MINE

Potassium Toxicity Study Design

Version 1.1

March 2019

Project #0444160-0017-02

Citation:
ERM. 2019. *Ekati Diamond Mine: Potassium Toxicity Study Design*. Version 1.1. Prepared for Dominion Diamond Mines ULC by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM
5120 49th Street, Suite 201
Yellowknife, NT
Canada X1A 1P8
T: (867) 920-2090
F: (604) 687-4277

ACKNOWLEDGEMENTS

This report was produced by James Elphick of Nautilus Environmental Company Inc., contracted by ERM Consultants Canada Ltd. (ERM), for Dominion Diamond Mines ULC. Review was conducted by Annette Muttray (Ph.D.) of ERM. Project management and further reviews of the study design were provided by Tonia Robb (Ph.D.) of ERM.

Table of Contents

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

d	Day
CCME	Canadian Council of Ministers of the Environment
Dominion Diamond	Dominion Diamond Mines ULC
ECCC	Environment and Climate Change Canada
ENR	Environment and Natural Resources
EQC	Effluent Quality Criteria
ERM	ERM Consultants Canada Ltd.
GNWT	Government of Northwest Territories
h	Hour
ICxx	Inhibition concentration estimated to cause an xx% inhibitory effect on the sublethal endpoint being measured (e.g., on growth or reproduction)
KCl	Potassium chloride
KPSF	King Pond Settling Facility
L	Litre
LLCF	Long Lake Containment Facility
Nautilus	Nautilus Environmental Company Inc.
SNP	Surveillance Network Program
SSWQO	Site Specific Water Quality Objective
the Board	Wek'èezhìi Land and Water Board

1. INTRODUCTION

In July 2017, Dominion Diamond Ekati ULC (Dominion Diamond) submitted a request to amend the Effluent Water Criteria (EQC) for potassium in W2012L2-0001 to align with the water quality benchmark for potassium, which is based on the site-specific water quality objective (SSWQO) for long-term exposure to potassium (ERM 2016). Specifically, the request was to replace the EQC maximum average concentration for potassium (at surveillance network program (SNP) sites 1616-30, 1616-43, and 1616-47) with the updated long-term SSWQO for potassium of 64 mg/L. The amendment request also included the replacement of EQC maximum concentration of any grab sample (at the same SNP locations) with the updated short-term SSWQO for potassium of 103 mg/L. The long- and short-term SSWQOs were calculated based on data that were available in the literature, from a survey of laboratories, and from additional tests that were performed in order that the SSWQOs could be calculated according to Canadian Council of Ministers of the Environment (CCME) guidance for deriving water quality guidelines (CCME 2007).

During the Water Licence Amendment process for the potassium EQC, there was concern with the predicted minor exceedances of the water quality benchmark in Leslie and Moose lakes. As an intervention, the Government of Northwest Territories (GNWT)-Environment and Natural Resources (ENR) recommended additional toxicity testing (link). The results of the recommended toxicity testing are expected to provide the regulatory community with additional confidence in the long-term protectiveness of the potassium water quality benchmark (i.e., that adverse effects would not be expected if minor exceedances of the potassium benchmark (the long-term SSWQO of 64 mg/L) were to occur in the aquatic receiving environment). The water quality prediction model for the Koala Watershed lakes downstream of the LLCF predicts minor short-duration (e.g., 2019; 64.8 mg/L for three months and 2020; 67.5 mg/L for three months in Leslie Lake) exceedances of the Ekati Diamond Mine potassium benchmark during the under-ice periods of 2019 to 2020 in Leslie Lake (ERM 2017).

In the June 15, 2018 letter regarding the Water Licence Amendment - Potassium EQC, the Wek'èezhìi Land and Water Board (the Board) included the following condition in W2012L2-0001 (Amendment #5 effective July 11, 2018) - Part H, Condition 37(a):

Within 90 days of the effective date of Amendment #5, the Licensee shall submit the Potassium Toxicity Study Design to the Board for approval. This study is to evaluate the toxicity responses of sensitive species using site water spiked with potassium concentrations at minimum 64 mg/L, 80 mg/L, and 100 mg/L. The Design must propose timelines for the submission of the Potassium Toxicity Study Report referred to in Part H, Condition 37(b).

The Potassium Toxicity Study Design Version 1.0 (ERM 2018) was submitted to the Board on October 3, 2018 in conjunction with Version 2.0 of the Response Plan for Potassium to fulfill the Board's Directive and Reasons for Decision on Version 1.4 of the Response Plan for Potassium. The Board provided their Directive and Reasons for Decision on Version 1.0 of the Plan on February 11, 2019. The Board approved Version 1.0 with additional direction for Version 1.1. Dominion Diamond is to submit Version 1.1 of the Potassium Toxicity Study Design to incorporate Revisions A and B within 30 days of communicating its decision.

This report comprises the Potassium Toxicity Study Design to meet Condition 37(a) and the Board's Directive and Reasons for Decision on Version 1.0 of the Potassium Toxicity Study Design (Table 1-1).

Table 1-1. Potassium Toxicity Study Design, Version 1.1 Concordance with the Board Directives on Potassium Toxicity Study Design, Version 1.0

The Board Directive, February 11, 2019*	Report Section(s)
The Potassium Toxicity Study Design Version 1.0 was approved with additional direction for Version 1.1. Within 30 days Dominion is to submit Version 1.1 to include:	
a. Revision A: In addition to ammonia testing at test initiation and termination, Dominion is to measure ammonia prior to each water renewal for both *Hyalella azteca* and Fingernail Clams.	3.1 and 3.2
b. Revision B: Dominion Diamond is to add the following text: "The Potassium Toxicity Study Report will describe how the results demonstrate that potassium concentrations have been maintained throughout the exposure."	3.1, 3.2, and 4.0
c. Decision #3: Dominion Diamond is to include a discussion of the results of the Potassium Toxicity Study in consideration of previous testing results referenced by Environment and Climate Change Canada (ECCC) comment 2, in submission of the Potassium Toxicity Study Report.	4.0
d. Decision #4: The Board has approved the submission deadline for the Potassium Toxicity Study Report of August 30, 2019.	4.0

** See http:/registry.mvlwb.ca/Documents/W2012L2-0001/W2012L2-0001%20-%20Ekati%20-%20AEMP%20-%20Potassium%20Toxicity%20Study%20Design%20and%20Response%20Plan%20V2%20-%20Reasons%20for%20Decision%20-%20Feb%2011_19.pdf*

2. STUDY SPECIES AND TEST DURATION

As directed by the Board, and consistent with the recommendations of GNWT-ENR, three sensitive species have been selected for this analysis.

A 28-day (d) survival and growth test using *Hyalella azteca*, which is an amphipod species, will be included in the evaluation. The 28-d duration has been selected for this test rather than a 42-d test option. Unlike the 42-d test, the 28-d test does not incorporate a reproduction endpoint; however, this is considered appropriate because amphipods would not be expected to be reproducing during under-ice conditions when potassium concentrations are the highest. Use of the 42-d method would more than triple the volume requirement of water for this test because of the larger number of replicates that are needed to account for the high degree of variability that is inherent in the reproductive endpoint. Thus, the 28-d test is considered an appropriate measure of sensitivity of this species, while minimizing the volume of water that will need to be transported from the site.

A 28-d survival and growth test using a fingernail clam, *Sphaerium simile*, has also been included in this study design because fingernail clams have been identified as sensitive species to major ions; this species was previously tested for the Ekati Diamond Mine in conjunction with evaluation of an appropriate benchmark for chloride (ERM Rescan 2014).

Finally, a ~30-d survival and growth test using fathead minnows, *Pimephales promelas*, has been included in this study design because GNWT-ENR indicated that there was some concern that the data for shorter-duration tests that were used for this species in deriving the SSWQO (i.e., 7 days) may underestimate sensitivity to this species.

In addition to the tests using sensitive species that have been proposed here, additional tests will be conducted to evaluate the interaction between potassium and sodium, which has been identified as a potential toxicity modifying factor. The sodium-potassium interaction investigation is not a specific requirement of Part H, Condition 37(a) and the design of the investigation has been outlined in the Response Plan for Potassium, Version 2.1. The sodium-potassium investigation will provide additional data for sensitive species, including *Ceriodaphnia dubia*, *H. azteca, Pseudokirchneriella subcapitata* and *P. promelas*.

3. METHODS

Approximately 800 L of water will be collected from the Ekati Diamond Mine from either Leslie Lake or Moose Lake and delivered to the Nautilus Environmental laboratory for use in these tests. Site water will be used as the dilution water in these tests (i.e., the constituent of interest will be added into the water following receipt at the laboratory), therefore the holding time constraints associated with the water do not need to be as strict as with toxicity tests using effluent samples. Hold time flexibility may be needed for timing related to initiation of the fingernail clam test, because the timing of this test will be dependent on the natural release of offspring from adult clams. Regardless, the tests will be planned in a manner that they are started as soon as possible following receipt of the site water. Analytical chemistry will be conducted on the water to characterize the constituents that are present in the water (e.g., total and dissolved metals, major ions, nutrients, dissolved organic carbon, total dissolved solids and total suspended solids).

It is not possible to test the toxicity of a cation such as potassium without introducing a corresponding anion (e.g., chloride, sulphate, bicarbonate, nitrate). To appropriately evaluate the toxicity of potassium, the counter-anion should contribute minimally to toxicity and be relevant to site conditions. Potassium chloride (KCl) will be used to introduce potassium into the test solutions in this study, since chloride is the predominant anion in the receiving environment at the Ekati Diamond Mine and Mount et al. (1997) demonstrated that chloride is considerably lower in toxicity than potassium. The potassium addition will take into account the potassium that is already present in the site water, which will be measured upon receipt, and will be supplemented using KCl to achieve concentrations of 64, 80, 100, and 200 mg/L (as potassium). The 64, 80, and 100 mg/L concentrations will be included, as specified by the W2012L2-0001 Part H, Condition 37(a). The additional potassium concentration of 200 mg/L is proposed in order to provide additional information related to the shape of the dose-response curve for potassium; this is expected to improve the statistical ability to detect a threshold for adverse effects related to potassium. The unadjusted site water will also be included in the tests, as well as the standard laboratory control water that is typically used by the laboratory for each of the test species.

3.1 *HYALELLA AZTECA*

A 28-d test using *H. azteca* will be conducted according to procedures published by USEPA (2000) and as adapted by Norberg-King et al. (2014). This method involves exposure of 7 to 8 day old organisms for 28 days, following which survival and dry weight are measured (Table 3.1-1).

Test organisms will be obtained from a commercial supplier and delivered by overnight courier to the laboratory. The test will be conducted at 23 ± 1°C with a photoperiod of 16 hour (h) light, 8 h dark. A disk of Nitex mesh will be placed into each 375 mL glass test chamber to provide substrate for the test organisms and the containers will be filled with 300 mL of exposure water. The test design involves use of five test replicates, each containing ten organisms.

Table 3.1-1. Test Conditions: *Hyalella azteca* Survival and Growth Test

Test Species:	*Hyalella azteca*
Organism Source:	Aquatic Biosystems, CO
Organism Age:	7- to 8-days old
Test Type:	Static-renewal
Test Duration:	28 days
Test Vessel:	375-mL glass container
Test Volume:	300 mL
Test Replicates:	5 per treatment
Number of Organisms:	10 per replicate
Control Water:	Reconstituted water (recipe from ECCC 2017)
Test Solution Renewal:	Three times per week (~ 80% renewal)
Test Temperature:	23 ± 1°C
Feeding:	1 mL of YCT daily to each container. Tetramin daily, with amounts increasing weekly: week 1: 0.25 mg, week 2: 0.5 mg, week 3: 1 mg, week 4: 1.5 mg in each test container.
Light Intensity:	500 to 1000 lux at water surface
Photoperiod:	16 h light / 8 h dark
Aeration:	None
Test Measurements:	Temperature, dissolved oxygen, pH, and specific conductivity measured daily; hardness and alkalinity measured upon arrival; hardness and alkalinity measured at test termination; potassium measured at test initiation and termination in each test concentration; total ammonia measured at test initiation, prior to each water renewal, and at test termination.
Test Protocol:	Modified from US EPA (2000), as described in Norberg-King et al. (2014)
Statistical Software:	CETIS Version 1.9.4.11
Test Endpoints:	Survival and dry weight
Test Acceptability Criteria for Controls:	Mean control survival of ≥ 80%
Reference Toxicant:	Sodium chloride

The USEPA (2000) test method involves twice-daily replacement of water, which is primarily because this test was designed as a sediment test method, and frequent renewal of the overlying water aids in maintaining dissolved oxygen concentrations in the water overlying the sediments. Water renewals in the present study will occur three times per week, which is consistent with Environment and Climate Change Canada (ECCC) requirements for water-only tests using *H. azteca* (ECCC 2017). The constituent of interest (i.e., potassium) is highly soluble, and would not degrade or volatilize during exposure and, consequently, this modification would not be expected to alter the sensitivity of the test, while limiting the large volume of water that is required from the site to a more manageable level.

Water replacements will be performed using a siphon and fresh solution will be replaced using a baffle to avoid disturbing the organisms. The containers will be fed daily with 1 mL of digested yeast, *Cerophyl* and trout chow (YCT) and a ramped (i.e., increasing weekly) addition of Tetramin fish flakes, as shown in Table 3.1-1. Temperature, dissolved oxygen, pH and specific conductivity will be monitored daily.

At the end of the test, the amphipods will be removed from the test chambers and survival will be recorded. The surviving *H. azteca* will then be dried at 60°C and dry weight will be measured. The number and weight of surviving amphipods will be evaluated statistically to determine point estimates (e.g., IC_{10} and IC_{20} estimates; the percent concentration of potassium that causes a 10% or 20% inhibitory effect in the sublethal endpoint being measured [i.e., growth or reproduction]). Control performance should be 80% survival or greater. Subsamples of each test concentration will be collected at test initiation and termination and analyzed for potassium. Subsamples will be collected and analyzed for ammonia at test initiation and termination, and in representative test concentrations prior to each water renewal. The Potassium Toxicity Study Report will describe how the results demonstrate the potassium concentrations have been maintained throughout the exposure.

3.2 *SPHAERIUM SIMILE*

Chronic toxicity tests will be conducted using juvenile fingernail clams. Test methods will be based on methods developed for unionid mussels and described by Wang et al. (2007). This test involves a 28-d exposure to juvenile bivalves and produces endpoints of survival and growth, based on shell length, which will be measured at the end of exposure (Table 3.2-1).

Table 3.2-1. Test Conditions: *Sphaerium simile* Survival and Growth Test

Test Species:	*Sphaerium simile*
Organism Source:	Field collected
Organism Age:	< two weeks post release juveniles
Test Type:	Static-renewal
Test Duration:	28 days
Test Vessel:	375-mL glass container
Test Volume:	300 mL
Test Replicates:	4 per treatment
Number of Organisms:	5 per replicate
Control Water:	Reconstituted water (recipe from ECCC 2017)
Test Solution Renewal:	Three times per week (~ 80% renewal)
Test Temperature:	23 ± 1°C
Feeding:	2 mL of Tetramin slurry and 2 mL *Pseudokirchneriella subcapitata* cells following water changes; 1 mL *P. subcapitata* cells on other days.
Light Intensity:	500 to 1000 lux at water surface
Photoperiod:	16 h light / 8 h dark
Aeration:	None
Test Measurements:	Temperature, dissolved oxygen, pH measured daily, specific conductivity measured during water changes; potassium measured at test initiation and termination in each test concentration; total ammonia measured at test initiation and termination, and prior to each water renewal.
Test Protocol:	Modified from Wang et al. (2007)
Statistical Software:	CETIS Version 1.9.4.11
Test Endpoints:	Survival, shell length, and dry weight
Test Acceptability Criteria for Controls:	Mean control survival of ≥ 80%
Reference Toxicant:	Sodium chloride

Adult fingernail clams (*S. simile*) will be collected for this project from a site in Ontario in the fall of 2018 and delivered to the Nautilus Environmental laboratory. The organisms will be cultured in the laboratory at 4 to 6°C to simulate winter conditions. Beginning in early January, temperature and feeding rate will be increased to simulate spring, which is anticipated to result in production of offspring that will be used for the tests. Tests are expected to be initiated in late February, 2019, using clams that have been released from the adults within a two-week window, and to coincide with a time period where collection of water from the Ekati mine site is still feasible with respect to ice cover. In the event that sufficient juveniles are not produced, adult clams will be collected again from the wild prior to release of offspring in April, and the tests initiated once water can be collected from the site, during freshet.

The test will be conducted at 23 ± 1°C with a photoperiod of 16 h light-8 h dark (Table 3.2-1). A 1 cm layer of clean sand will be placed into each 375-mL glass testing chamber and filled with the 300 mL of exposure water. Four replicates will be used per concentration with five juvenile clams in each test chamber. A subsample of ten clams will be sampled at test initiation and shell length and dry weight measured.

Water renewals will occur three times each week using a siphon and fresh solution will be replaced using a baffle to avoid disturbing the organisms. Feeding will be comprised of 2 mL of algal cells and 2 mL of Tetramin (prepared as 1 g of Tetramin in 75 mL of water), which will be added into each container following water renewal on water renewal days; 1 mL of algal cells will be added to the test containers on days that the water is not renewed. Temperature, dissolved oxygen, and pH will be monitored daily, and specific conductivity will be measured during water renewal.

At the end of the test, the clams will be removed from each test chamber and survival and shell length will be measured using an ocular micrometer. The surviving clams will then be dried at 60°C and dry weight will be measured. The number, length, and weight of surviving clams will be evaluated statistically to determine point estimates (e.g., IC_{10} and IC_{20} estimates). Control performance should be 80% survival or greater. Subsamples of each test concentration will be taken at test initiation and termination and analyzed for potassium. Subsamples of each test concentration will be collected and analyzed for ammonia at test initiation and termination, and in representative test concentrations prior to each water renewal. The Potassium Toxicity Study Report will describe how the results demonstrate the potassium concentrations have been maintained throughout the exposure.

3.3 *PIMEPHALES PROMELAS*

A test using *P. promelas*, involving an exposure from the egg stage to 28 days post-hatch will be conducted according to procedures published by ASTM (2013) and USEPA (1998). This method involves exposure of approximately 30 days, following which survival biomass and incidence of deformities are recorded (Table 3.3-1).

Test organisms will be obtained from a commercial supplier and delivered by overnight courier to the laboratory. The test will be conducted at 25 ± 1°C with a photoperiod of 16 hour (h) light, 8 h dark. The test design involves use of four test replicates, each containing ten organisms in 1-L plastic test chambers. The test is initiated with 15 eggs in each chamber, which are supplemented with eggs from two sacrificial replicates to replace any unhatched eggs following hatch, so that the exposure of hatched fish also begins with 15 fish in each of four replicates.

Table 3.3-1. Test Conditions: *Pimephales promelas* Survival and Growth Test

Test Species:	*Pimephales promelas*
Organism Source:	Aquatox, Hot Springs, AR
Organism Age:	< 24 hr
Test Type:	Static-renewal
Test Duration:	From egg stage to 28 days post hatch
Test Vessel:	1-L plastic container
Test Volume:	1 L
Test Replicates:	4 per treatment
Number of Organisms:	15 per replicate
Control Water:	Dechlorinated City of Calgary tapwater
Test Solution Renewal:	Daily (~ 80% renewal)
Test Temperature:	25 ± 1°C
Feeding:	Twice a day, after hatch, with newly hatched brine shrimp (*Artemia nauplii*)
Light Intensity:	100 to 500 lux at water surface
Photoperiod:	16 h light / 8 h dark
Aeration:	None unless dissolved oxygen falls to less than 60% saturation
Test Measurements:	Temperature, dissolved oxygen, pH measured daily, specific conductivity measured during water changes; potassium measured at test initiation and termination in each test concentration; total ammonia measured at test initiation and termination.
Test Protocol:	US EPA (1996) and ASTM (2013)
Statistical Software:	CETIS Version 1.9.4.11
Test Endpoints:	Survival, hatch, biomass, normal development
Test Acceptability Criteria for Controls:	> 66% hatch, ≥ 70% post-hatch survival
Reference Toxicant:	Sodium chloride

Water replacements will be performed using a siphon and fresh solution will be replaced using a baffle to avoid disturbing the organisms. The test organisms will be fed twice daily with newly hatched *Artemia nauplii*. Temperature, dissolved oxygen, pH, and specific conductivity will be monitored daily.

At the end of the test, the fish will be removed from the test chambers and survival and incidence of deformities will be recorded. The surviving fish will then be dried at 60°C and dry weight will be measured. The hatch rate, survival, incidence of deformities, and biomass will be evaluated statistically to determine point estimates (e.g., IC_{10} and IC_{20} estimates). For the test to be considered acceptable, at least 66% of eggs should hatch and at least 70% of hatched fish should survive to test termination in the control. Subsamples of each test concentration will be collected at test initiation and termination and analyzed for potassium.

4. REPORTING

The laboratory testing is expected to be completed by the end of March, 2019, if the laboratory-reared clams successfully produce the offspring that are required for the tests and water is collected in February 2019. Alternatively, if water is collected during freshet, it is anticipated that tests will be initiated in mid-June, and testing being complete by the mid-July 2019.

If laboratory testing is completed as planned, the Potassium Toxicity Study Report is therefore anticipated to be produced by August 30, 2019. As outlined in Part H, Condition 37(b) the report will include a summary of the results and '*any implications to potassium management at the Ekati Diamond Mine*'. The Potassium Toxicity Study Report will also include a discussion of the Potassium Toxicity Study results in consideration of previous testing results on the exposure of Fingernail Clams to chloride. The Potassium Toxicity Study Report will describe how the results demonstrate the potassium concentrations have been maintained throughout the exposure.

REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Glossary and Abbreviations section.

ASTM. 2013. Standard guide for conducting early life-stage toxicity tests with fishes. E1241-05, 29 p.

CCME. 2007. *A Protocol for the Derivation of Water Quality Guidelines for the Protection of Aquatic Life.* Winnipeg, MB, Canada

ECCC. 2017. *Biological test method: test for survival, growth and reproduction in sediment and water using the freshwater amphipod* Hyalella azteca. Third Edition. EPS1/RM/33. September 2017.

ERM Rescan. 2014. *Ekati Diamond Mine: Toxicity of Chloride to the Fingernail Clam,* Sphaerium simile. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM. 2016. *Ekati Diamond Mine: Revised Site-Specific Water Quality Objectives for Potassium*. Prepared for Dominion Diamond Ekati Corporation by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM. 2017. *Ekati Diamond Mine: 2017 Koala Watershed Water Quality Model*. Prepared for Dominion Diamond Ekati ULC by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

ERM. 2018. *Ekati Diamond Mine: Potassium Toxicity Study Design Version 1.0.* Prepared for Dominion Diamond Ekati ULC by ERM Consultants Canada Ltd.: Yellowknife, Northwest Territories.

Mount, D. R., D. D. Gulley, J. R. Hockett, T. D. Garrison, and J. M. Evans. 1997. Statistical models to predict the toxicity of major ions to *Ceriodaphnia dubia*, *Daphnia magna* and *Pimephales promelas* (fathead minnows). *Environ. Toxicol. Chem.* 16:2009-2019.

Norberg-King, T. J., R. Hockett, D. R. Mount, C. Ivey, C. Ingersoll, N. Kemble, B. Brumbaugh, E. Hammer, D. Soucek, and L. Taylor. 2014. *Inter-lab testing of* Hyalella azteca *water and sediment methods: 3. Results from 10- to 42-d tests conducted with the new water-only method*. Proceedings of SETAC, Vancouver, BC, Canada, November 09 - 13, 2014.

USEPA. 2000. *Methods for measuring the toxicity and bioaccumulation of sediment-associated contaminants with freshwater invertebrates*. EPA 600/R-99/064. March 2000.

USEPA. 1996. *Ecological Effects Test Guidelines. OPPTS 850.1400 Fish Early-Life Stage Toxicity Test.* EPA-712-C-96-121, Public Draft.

Wang, N., C. G. Ingersoll, I. E. Greer, D. K. Hardnesty, C. D. Ivey, J. L. Kunz, W. G. Brumbaugh, F. J. Dwyer, A. D. Roberts, T. Augspurger, C. M. Kane, R. J. Neves, and M. C. Barnhart. 2007. Chronic toxicity of copper and ammonia to juvenile freshwater mussels (Unionidae). *Environ. Toxicol. Chem.* 26: 2048-2056.